REMARKS

Reconsideration of the application is respectfully requested. Independent Claims 1 and 7 have been amended along with dependent claims 3, 4, 5, 6 and 11. New Claims 13 and 14 have been added.

Claim Objections

The Examiner has objected to Claim 1 for certain informalities. In response Applicant has adopted the Examiners proposed correction. Reconsideration is requested.

Section 112 Rejections

The Examiner has rejected Claims 1-2-7, 8, 10 and 11 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner alleges that the phrase "extended range" is indefinite. In addition, the Examiner alleges that the phrase "having a durometer hardness less than metallic rounds" is indefinite.

With respect to the rejection asserting that "extended range" is indefinite, Applicant submits that the term "extended range" as used in the specification is well known and understood to one skilled in the art of less lethal projectiles.

Standard / lethal ammunition is generally recognized in terms of accuracy as measured in 'Minute of Angle' or fractions thereof. (MOA equals the arc of 1" @100 yds). Accuracy can then be extrapolated at greater ranges. Improvements in accuracy are generally represented by lower MOA parameters. One (1) MOA is a 'standard' for most commercially available rifle / ammo combinations.

Those skilled in the art regarding the deployment of Less Lethal munitions understand that the typical 'long-range' shot with acceptable accuracy is limited to 15-25 yards. An extended-range capability would start at +/- 30 to 35 yards, representing a 20-30% improvement in range within acceptable accuracy limits. Accuracy is measured in much different terms, usually the ability to impact a specific point on the targets body. That would relate generally to a 3-5" radius from the specific point of aim.

The bore at the rearward end allows the projectile to attain a greater overall length while maintaining the same weight as a projectile without said bore. The greater length provides increased ballistic stability and greater range and accuracy over the industry standard rubber baton style projectile which uses an arrangement of fins similar to that of an arrow at the rearward end. The hollow rearward bore creates air resistance at the rearward end more effectively than a finned arrangement. The increased overall length and air drag at the rear achieve a higher level of in-flight stability and ballistic predictability desired without having

to incorporate the unique properties needed for spin stabilization. The closed forward end, with its resultant added weight are the design characteristic which create the conditions that allow the rearward bore to isolate the air resistance to the rear of the projectile. If, for example the forward end was open, (i.e. tubular) airflow would then be equalized over the entire surface area of the projectile and eliminate the aerodynamic stability to maintain oriented flight.

The shape of the forward end does not affect range in the present invention. The curvature at the forward end serves to provide increased surface area over a flat surface. The semi-hemispheric shape (in cross section) is not required specifically for any purpose other that the described increase in surface area. In other words, almost any shape, (star, hexagonal, octagonal) slightly raised above the solid forward end (forward of the plane of the rim) as long as there were no sharp protrusions would suffice to provide the surface area increase.

The increased surface area provides a reduced energy density as explained hereinafter. As a point of clarification, typical lethal projectiles such as those designed for very high velocity and great range rely on specific ogive shape for aerodynamic stability. The relatively short range (in comparison) and relatively low velocity of the present invention require no reliance on ogive shape for stability. Also for clarification, there is no requirement or

expectation that the projectile of this application will deform on impact due to its non-metallic or low durometer properties. It relies on a calculated formula of mass x velocity (KE simplified) delivered at a given distance. If the projectile were metallic, the expected weight increase would disallow either its volume and or specific shape or otherwise constrain the velocity needed to achieve the combination of accuracy and energy requirements needed to attain an 'extended range' capability and still be considered less lethal.

With respect to the Examiners rejection that the phrase "having a durometer hardness less than metallic rounds" is indefinite, Applicant submits that the phrase is understandable to one skilled in the art of less lethal projectiles. Specifically, Low durometer material properties affect less lethal munitions in two ways. On one hand, low durometer can allow a projectile to deform on impact, thus mitigating available KE at the time of impact to achieve a more desirable terminal effect. The deformation can increase the impact surface area, creating a condition of lower energy density (KE/ inches^2), thus reducing penetration potential or deep tissue injury. Another effect of low durometer material is that as the material is 'crushed' or deforms on impact, the kinetic energy is transferred over a longer time signature, thus also managing the KE in a more predictable and desirable manner.

The other characteristic obtained via reduced durometer is the corresponding reduction in overall mass or weight. For example, a plastic or rubber projectile

at the same volume as a metallic projectile has significantly less KE at any given speed. The ability to drive a projectile of lower weight at higher velocity has the potential to safely increase range while maintaining a specified level of KE.

Regarding the examiners assertion that the phrase "having a durometer hardness less than metallic rounds" is indefinite because some metal rounds, such as lead have a durometer/shore hardness less than 90, Applicant submits that there are no references to metallic hardness measured on the Shore scale. The comparison of Lead and other metallic hardness is measured primarily in Rockwell and Brinnell scales. The examiner makes an assumption regarding durometer hardness of lead that is not supported or apparent to one skilled in the art.

Therefore Applicant submits that the phrase "extended range" and are well known and understood to one skilled in the art of less lethal projectiles. Withdrawal of the Rejection under Section 112 is hereby requested.

Section 102 Rejections

The Examiner has rejected Claims 1, 3, 5 and 6 under 35 U.S.C. §102 (b) as being anticipated by Lyon (U.S. Patent No. 6,041,712). Applicant respectfully traverses.

Less Lethal projectile design and performance relies on a complex interaction of specific quantitative variables in order to achieve a predictable and low lethality outcome at a given distance.

As a general rule, 'lethal' ammunition for hunting and military purposes is not constrained by having *too much* velocity, kinetic energy, penetration or tissue and organ destruction. On the contrary, having more of the listed attributes is not taken as undesirable. When 'High Velocity' is desired as an improvement over the norm, the corresponding increase in kinetic energy and penetration is often either disregarded or considered 'an added bonus'. In the same vein, the ammunition described above must also meet a level of accuracy that the industry or marketplace deems as acceptable, usually measured in hundreds of yards.

Other than accuracy, a primary factor in typical ammunition design is the ceiling levels for internal chamber pressures as dictated by SAAMI (Small Arms and Ammunition Manufacturers Institute) which is the lead industry governing body.
Chamber pressures in shotgun ammo are typically 9-11,000 psi and often many thousands more in rifle and pistol calibers. 12 ga. Less Lethal operates in the 2,000 psi range. Likewise a deer accidentally shot in the head rather than the chest is still a dead deer and 'acceptable'. A less lethal round directed at the torso but instead striking the head is wholly unacceptable. When projectile penetrates a deer and kills it, or it overpenetrates and exits the far side, the

deer is still dead. No level of penetration is accepted in Less Lethal, exemplifying that *more is not better.*

The primary issues in Less Lethal munitions (in no order of importance) are Accuracy, delivered Kinetic Energy (KE) and Terminal Effect (TE). Terminal Effect can be simplified as the transfer of KE without penetration. It is understood by those skilled in the art that minimal to moderate tissue disruption such as abrasion and bruising will occur and is acceptable. It is also understood that there must be a very low threshold for significant injury from deep tissue and organ damage.

Designs in Less Lethal munitions must also take into consideration that the product will be evaluated against an industry standard the quantifies the terminal effect of the projectile. The test is the National Institute of Justice (NIJ) 101.04 protocol. This is the same test used to evaluate police body armor with a slight modification.

The test is based on the use of a large block of a specific clay medium (Roma Plastina #1) maintained at a specific temperature. When testing body armor, the bullets are fired at the armor which is placed on top and in contact with the clay medium. Providing the armor stops the bullet, the "back-face" deformation (BFD) is measured. The BFD is represented by the 'dent' or cavity left on the face of the clay test bed by the bullet impact.

It has been established by the NIJ that Backface Deformation in excess of 44 mm would represent serious or fatal injury to internal organs. Keep in mind, there is no projectile penetration, as the projectile was stopped by the body armor. For Less Lethal testing, the body armor is replaced by a layer of cotton "T" Shirt material.

If a given LL projectile is fired at 10 yards and exceeds the 44mm depth of BFD, that projectile 'fails' at that distance. The projectile / loading can either be modified or fired from a greater distance. The distance at which a projectile 'passes' is the accepted minimum engagement distance for that particular projectile / velocity combination. The max. distance is what is generally accepted in terms of user acceptable accuracy rather than delivered energy.

It should be obvious that increasing the weight or velocity of a given projectile fired at the otherwise minimum distance would cause 'failure' due to increased KE, though there are other factors as well. If a hard rubber, flat nosed projectile of a given weight and velocity 'passed' the test at the min. distance, substituting it with a pointed projectile of the same material, weight and velocity, the shape would cause it to penetrate more deeply and fail. If the pointed projectile of the given weight and velocity were formed of a compliant material, deformation on contact could allow it to pass the test. By the same token, making the flat nosed projectile out of the compliant material would reduce the min. distance which by itself is a desireable goal in LL design.

Therefore projectiles purposefully designed as Less Lethal require considerations not required of typical munitions. Typical munitions are not expected to have upper limits of penetration and energy and thus one skilled in the art would not look to a typical munition to teach or suggest a less lethal design consideration.

Lyon claims a spin stabilized projectile. The use of spin stabilization is the methodology Lyon uses to attain extended range and flight stability (as stated in Lyon abstract) over an equivalent projectile without spin. Lyon describes a cylindrical body with open rearward end and closed, flat forward face. Lyon also discloses a nose of compliant material affixed to said forward face. The nose material allows Lyon to maintain the claim of less lethal. In Lyon, the compliant property of the nose clearly shows the intent that it crush or deform on impact to mitigate the KE carried to the target. A person skilled in the art of Less Lethal munitions and small arms ammunition in general understands that spin stabilization by using a rifled bore puts very high rotational and frictional forces on the projectile.

The rearward portion of Lyon teaches it is *bore-riding and has a rotating band.* It is well known in the art that the material requirements needed to engage and engrave the rifling are mutually exclusive of the properties needed by the *compliant nose material.* If Lyon were not of binary composition, the complaint nose material could not withstand the forces subjected to it by the rifling and likewise, the material normally engaging the rifling if used as

the nose, would exclude the projectile from the realm of Less Lethal. It is obvious that the high friction created in the barrel by contact between the Lyon device and the rifling would require greater propellant pressure to expel it from the barrel than would a similar projectile not subject to the described friction. The required pressure results in higher velocity on exit from the muzzle. In order for Lyon to maintain low lethality, the compliant nose material is required.

Lyon attains extended range via externally applied spin supplied by the rifled bore of the weapon. The present invention has no reliance on spin stabilization to achieve extended range capability. The applicant requests that the examiner consider that Lyon is clearly weapon dependant in achieving extended range and in-flight stability and that the present invention does so independently.

The applicant also requests the examiner consider that shape has function and similar shapes can offer different function based on material properties and intent of the inventor. Lyon in Claim 3, offers that the rounded nose shape serves an aerodynamic function. Even though unstated in Lyon, it is obvious that the requirement for the complaint foam rubber nose has the intent of the inventor to serve as the methodology for managing the KE on impact. The present invention makes no such claim. As explained earlier, the nose portion of the present invention serves to increase surface area as a means of KE management.

The design intent of the present invention uses differing methodology to attain in-flight stability. Wherein Lyon claims spin, the present invention intentionally uses air drag created by the right angle created where the sidewall and what would be the rear face of the projectile. The examiner should be aware that the hollow bore at the rearward end serves no intentional element of the drag stabilization for the projectile. The hollow bore permits the present invention to attain increased length while maintaining equivalent weight. Similar to a primitive arrow, length significantly greater than diameter, with drag produced by the fletching feathers results in stable, oriented flight. As alluded to earlier, the common less lethal rubber baton similar to the present invention seeks to improve uses such a finned arrangement. The applicants of the present invention observed that the fins of the typical rubber baton were of the same of the outside diameter as the forward end of the projectile because the were restricted by the cartridge case and barrel diameter. Because they do not extend into the airstream, they are unable to create sufficient drag to stabilize the projectile in its relatively short trajectory distance. In an arrow, the fletchings extend far into the airstream beyond the outside diameter of the arrow shaft and create sufficient drag to maintain correctly oriented flight. A picture of the 'standard' finned baton, the present inventions and Lyon have been included on the last page for reference.

Additionally, the present invention manages KE via velocity and internal pressure needs rather than reliance on a specific and additional material property as in Lyon. The

present invention not only is not subject to the increased frictional forces and increased pressure requirements of the rifled bore system, it makes further improvement by friction reduction adaptation. The dimples on the sides of the current invention serve only to reduce the surface area available to friction with the barrel of the weapon. By reducing friction, less pressure is needed to attain a desired velocity, thus aiding the ability to manage KE and achieve desired low lethality.

Additionally, Independent Claims 1 has been amended to recite that "said body being formed of a homogeneous non-metallic material". As stated above, Lyon discloses having a projectile of binary composition, therefore, Lyon fails to disclose each and every feature of the claimed invention.

Accordingly, claims 1, 3, 5 and 6 include specifically recited elements which are not found in the disclosure in Lyon. As such, as a matter of law, Lyon cannot anticipate claims 1, 3, 5 and 6 of the present invention.

It is, therefore, respectfully submitted that claims 1, 3, 5 and 6, as well as the claims which depend therefrom, define patentably over Lyon.

The Examiner has also rejected Claims 1, 3, 5 and 6 under 35 U.S.C. 102(b) as being anticipated by Steer (U.S. Patent 5,343,850). The applicant first requests that the examiner consider that Steer teaches a toy design with vastly differing intents and consequences. Also, the differences are supported by the relative current US Class, Current Intl. Class and the Field of Search embodied in Steer vs. the present invention and Lyon as well.

Steer teaches a hollow bore at the rearward end intended as a means of externally affixing projectile 50 and 60 to a pneumatic launcher. The fins (51, 61) are similar to which the present invention seeks to improve on. Fins 51 and 61 also appear to negate any weight forward condition caused by the hollow rear bore.

Additionally, Independent Claims 1 has been amended to recite that "said body being formed of a homogeneous non-metallic material" and further to recite "that the center of mass of said projectile is closer to said forward end than to said rearward end". As stated above, Lyon discloses having a projectile of binary composition, therefore, Lyon fails to disclose each and every feature of the claimed invention. Furthermore, amended independent Claim 1 now contains the limitation that the center of mass is close to the forward end. As stated by the Examiner on Page 4 of the Official Action, the projectile of Steer might have a center of mass that is rearward of the center of gravity and therefore can not anticipate the amended independent claim 1.

Accordingly, claims 1, 3, 5 and 6 include specifically recited elements which are not found in the disclosure in Steer. As such, as a matter of law, Steer cannot anticipate claims 1, 3, 5 and 6 of the present invention.

It is, therefore, respectfully submitted that claims 1, 3, 5 and 6, as well as the claims which depend therefrom, define patentably over Steer.

The Examiner has also rejected Claims 1, and 3 - 6 under 35 U.S.C. 102(b) as being anticipated by Tanner (U.S. Patent 3,058,420).

The applicant requests the examiner to again take lethal / less lethal projectile design requirements under consideration. The applicant also again offers that similar forms can provide various intended function even in similar design classifications. The applicant argues that merely substituting a non-metallic material for a metallic body of a projectile would automatically create a less lethal condition. Typical ammunition design has no limiting ceilings on delivered kinetic
energy or penetration.

Tanner seeks to improve on the fact that slugs suffer negatively from deformation inside the gun due to pressure it is subjected to upon firing. The applicant of the present

invention observes that Tanner teaches a method of improving slugs then available and describes a methodology for limiting said deformation as described in Col. 1, lines 23-33 and 44-46 as well as Co. 2, lines 48-53

The applicant asks the examiner to reconsider his position on Page 4 of the office action where he identifies the Projectile (7) and the Projectile body (8a-d).

The applicant argues that the Projectile (7) is the pre-existing slug on which Tanner seeks to improve. The applicant contends that 8a-d are incidental attachments to the 'true' projectile.

Figure 5 appears hollow based even with the addition of 8c but has a rudimentary pointed tip as opposed to domed. Figure 6 is essentially not hollow based but actually tubular in design with a truncated conical profile.

Tanner achieves 'extended range' by limiting deformation of the slug within the bore, a one dimensional approach. The applicant of the present invention offers that no element found in Tanner via design similarity nor being obvious to one skilled in the art could be summarily taken as a less lethal projectile based on the previously stated position on Lyon and Steer.

Additionally, Independent Claims 1 has been amended to recite that "said body being formed of a homogeneous non-metallic material". As stated above, Tanner discloses having a projectile of metallic and non-metallic composition, therefore, Tanner fails to disclose each and every feature of the claimed invention.

Accordingly, Claims 1 and 3 - 6 include specifically recited elements which are not found in the disclosure in Tanner. As such, as a matter of law, Tanner cannot anticipate claims 1 and 3 - 6 of the present invention.

It is, therefore, respectfully submitted that claims 1 and 3 - 6, as well as the claims which depend therefrom, define patentably over Tanner.

Section 103 Rejections

The Examiner has rejected Claims 7, 11-12 under 35 U.S.C. §103 (a) as being unpatentable over Hayashi (U.S. Patent No. 4,043,267) in view of Amick (U.S. Patent No. 3,527,880).

The applicant again asks the examiner to evaluate the present invention and Hayashi / Amick in the light of the previously presented Lethal / Less Lethal and Form / Function arguments.

Hayashi clearly states the intended function of his device in Background of invention as an improved wad structure (line 12), aiding in mass production (lines 13-15) and reducing recoil (Line 45)

In Figures 4, 8, 12 and 16 Hayashi teaches a projectile similar to that in the present invention. However, Figs. 6,10,14,and 18 dissolve the similarities between Hayashi and the present invention. Hayashi clearly intends the hollow rear bore as a means of physical attachment to the wad assembly. That intent is clearly shown in the diagram progressions 4-6, 8-10, 12-14 and 16-18. When the wad assembly in Hayashi attaches to the projectile at the said hollow rear bore, Hayashi is then teaching a hollow cavity not at all similar to the present invention.

The Examiner should also consider that 'extended range' and 'more accurate' are terms only realized in any ammunition after they have been fired. In that light, Hayashi achieves his goal by different methodology than the present invention.

The present invention uses the rear bore as a means to increase length without coincidental weight increase, differing significantly than the dynamic attachment of the sub-assemblies under pressure of ignition sought by Hayashi.

The applicant observes that the examiner is only offering a portion of the position taken by Amick concerning rubber bullets. The text preceding that cited by the examiner (Col.3, line 62) explains that polymer used to adhere tungsten particles in a matrix form is ineffective. Amick uses a dangerous argument that a bullet won't penetrate well simply based on that its rubber. Amick makes no consideration for projectile weight, shape or velocity. As stated previously, a soft foam rubber projectile such as in Lyon, will by intent deform as a means of KE management. If the Lyon nose material in the same shape were made of dense, hard rubber the kinetic energy would almost surely cause severe injury or death, with or without penetration. Amick has no disclosure or teaching relating to the fact that that penetration is not the sole contributor to serious injury or death when evaluating less lethal munitions. Hayashi contains no teaching or suggestion as to the independent ability of the hollow base to provide any in-flight stability to his projectile.

Furthermore, there would be no motivation to look to Hayashi to arrive at the present invention. Specifically, the present invention is directed to an 'extended range less lethal projectile. The hollow base of the present invention is purpose specific in its efficacy to allow controlled airflow around the rear of the projectile to allow extended range stability and accuracy not available in other less lethal munitions. The present invention has no provision for attachment between the wad and projectile.

In the present invention, the forward-weighted condition is designed to compliment the airflow around the rearward end of the projectile to enhance extended range accuracy. The convex forward end also serves to increase surface area to minimize the potential for penetration by spreading the kinetic energy over a larger area. Hayashi contains no teaching with respect to the frontal shape design.

Amick teaches achieving less lethal design by assumed deformation on impact. In contrast the present invention specifically relies on light weight and frontal design to minimize inertia and enhance the effective distribution of kinetic energy to disallow penetration. There is no mention in the present invention that deformation on impact is a desired or intended outcome. The present invention is specifically intended to be both lightweight and rigid. A heavier composition, fired at a velocity necessary to attain extended range with the desired degree of accuracy would have excessive inertia and kinetic energy to be considered a less lethal projectile. Similarly, a projectile with the deformable qualities as suggested by Amick would not be able to sustain an acceptable aerodynamic shape then subjected to the pressures and velocities needed to impact targets at extended range.

Therefore, there would be no motivation to look to Hayashi and Amick to arrive at the present invention. Thus, both Hayashi and Amick fail as a reference as there would be no motivation to combine Hayashi with Amick to arrive at the present invention.

It is, therefore, respectfully submitted that claims 7 and 11-12, as well as the claims which depend therefrom, define patentably over Hayashi in view of Amick.

Claim 9 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hayashi in view of Amick and further in view of U.S. Patent No. 6,615,739 to Gibson. This determination is respectfully traversed.

Regarding Gibson, The Form vs Function argument again applies. Dimples may indeed promote accuracy and distance in terms of use on high velocity and long range projectiles, in which Less Lethal munitions including the present invention are not.

Even though the form and appearance of dimples may be similar, the present invention uses the dimpled surface to;

1) Reduce friction inside the firing bore of the weapon.

2) Regulate the weight of the present invention by varying the size and depth of the dimple.

Applicant submits that there is a very delicate inter-relationship between projectile weight and velocity resulting in a prescribed level of Kinetic Energy not considered in

'regular' projectile design. Projectile shape and terminal effect (i.e. deformation ect.) also affect potential for death or injury independent of the KE value.

Gibson describes frangible spherical projectiles containing a marking agent. The present invention describes the purpose of the dimples serving a significantly different purpose. The dimples in the present invention reduce surface area available to friction within the barrel of the firearm and reduce the overall weight of the projectile. Though both inventions tend to be non-lethal projectiles, the purpose and intent of the dimples are not related.

Gibson teaches that the purpose of the dimples are to initiate case rupture or enhance accuracy. Gas operated guns (paintball) operate at extremely low velocities, usually less than 300 fps. This type of projector (gun) has an extreme range of less than 30 yards. While Gibson claims that the dimples will permit improved rupture of paintballs and possibly enhance their accuracy. However, in accordance with the present invention, the use of dimples has a different purpose.

In the present invention, dimples are used to significantly reduce the surface area that comes in contact with the interior of the shotgun barrel. The applicants recognize that dimpling actually increases total surface area, but reduces actual surface available to

friction. Reduced surface contact area on the slug reduces friction which in turn requires less propellant pressure to properly fly the slug at lower velocities. Having the ability to reduce velocity enhances the low lethality of the projectile. The reduction in total projectile weight caused by removing material when making the dimples also enhances the low lethality of the projectile at any given velocity.

Therefore, there would be no motivation to look to Gibson to add dimples to the present invention, as Gibson discloses dimples for a completely different purpose as in the present invention. Thus, Gibson fails as a reference as there would be no motivation to combine Gibson with Hayashi and Amick to arrive at the present invention.

In establishing a *prima facie* case of obviousness, the cited references must be considered for the entirety of their teachings. *Bausch & Lomb, Inc. v. Barnes-Hind, Inc.*, 230 U.S.P.Q. 416, 419 (Fed. Cir. 1986). It is impermissible during examination to pick and choose from a reference only so much that supports the alleged rejection. *Id.* Thus, the express teachings of Gibson, which would lead one away from the invention defined by claim 9, may not be ignored during examination.

To arrive at the present invention as defined by claim 9, the Action not only ignored the express teaching of Gibson, but also engaged in hindsight reconstruction because none of

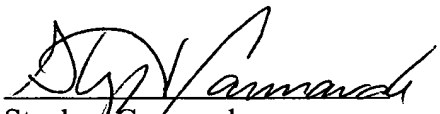
the documents of record teach or suggest the process as claimed, as the cited references, i.e., Hayaski, Amick and Gibson, all require features not found in the present invention. It is well established that hindsight reconstruction of a reference does not present a *prima facie* case of obviousness and any attempt at hindsight reconstruction using Applicants' disclosure is strictly prohibited. *In re Oetiker*, 24 U.S.P.Q.2d 1443, 1445-46 (Fed. Cir. 1993).

Thus, Hayashi, Amick and Gibson, individually or in combination, fail to teach the present invention as set forth in claim 9.

Having responded in full to the present Office Action, it is respectfully submitted that the application, including claims Claims 1, 3, 7, 10-12, is in condition for allowance. Favorable action thereon is respectfully solicited.

Should the Examiner have any questions or comments concerning the above, the Examiner is respectfully invited to contact the undersigned attorney at the telephone number given below.

Respectfully submitted,



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